SEQUENCE LISTING

<110> MOECKEL, Bettina
       BATHE, Brigitte
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<120> Nucleotide sequences coding for the rpoB gene

<130> 219774US0XCIP

<140> new application
<141> 2002-02-19

<150> DE 10107229.5
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<150> US 09/887052
<151> 2001-06-25

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<170> PatentIn version 3.1

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cttaatggcc ttgaccagcc aggtgcaatt acccgcgtga g gtg ctg gaa gga ccc      716
                                              Val Leu Glu Gly Pro
                                              1                   5

atc ttg gca gtc tcc cgc cag acc aag tca gtc gtc gat att ccc ggt        764
Ile Leu Ala Val Ser Arg Gln Thr Lys Ser Val Val Asp Ile Pro Gly
                10              15              20

gca ccg cag cgt tat tct ttc gcg aag gtg tcc gca ccc att gag gtg        812
Ala Pro Gln Arg Tyr Ser Phe Ala Lys Val Ser Ala Pro Ile Glu Val
            25              30              35

ccc ggg cta cta gat ctt caa ctg gat tct tac tcc tgg ctg att ggt        860
Pro Gly Leu Leu Asp Leu Gln Leu Asp Ser Tyr Ser Trp Leu Ile Gly
        40              45              50

acg cct gag tgg cgt gct cgt cag aag gaa gaa ttc ggc gag gga gcc        908
Thr Pro Glu Trp Arg Ala Arg Gln Lys Glu Glu Phe Gly Glu Gly Ala
    55              60              65

cgc gta acc agc ggc ctt gag aac att ctc gag gag ctc tcc cca atc        956
Arg Val Thr Ser Gly Leu Glu Asn Ile Leu Glu Glu Leu Ser Pro Ile
70              75              80              85

cag gat tac tct gga aac atg tcc ctg agc ctt tcg gag cca cgc ttc       1004
Gln Asp Tyr Ser Gly Asn Met Ser Leu Ser Leu Ser Glu Pro Arg Phe
                90              95              100

gaa gac gtc aag aac acc att gac gag gcg aaa gaa aag gac atc aac       1052
Glu Asp Val Lys Asn Thr Ile Asp Glu Ala Lys Glu Lys Asp Ile Asn
                105             110             115

tac gcg gcg cca ctg tat gtg acc gcg gag ttc gtc aac aac acc acc       1100
Tyr Ala Ala Pro Leu Tyr Val Thr Ala Glu Phe Val Asn Asn Thr Thr
        120             125             130

ggt gaa atc aag tct cag act gtc ttc atc ggc gat ttc cca atg atg       1148
Gly Glu Ile Lys Ser Gln Thr Val Phe Ile Gly Asp Phe Pro Met Met
    135             140             145

acg gac aag gga acg ttc atc atc aac gga acc gaa cgc gtt gtg gtc       1196
Thr Asp Lys Gly Thr Phe Ile Ile Asn Gly Thr Glu Arg Val Val Val
150             155             160             165

agc cag ctc gtc cgc tcc ccg ggc gtg tac ttt gac cag acc atc gat       1244
Ser Gln Leu Val Arg Ser Pro Gly Val Tyr Phe Asp Gln Thr Ile Asp
                170             175             180

aag tca act gag cgt cca ctg cac gcc gtg aag gtt att cct tcc cgt       1292
Lys Ser Thr Glu Arg Pro Leu His Ala Val Lys Val Ile Pro Ser Arg
                185             190             195

ggt gct tgg ctt gag ttt gac gtc gat aag cgc gat tcg gtt ggt gtt       1340
Gly Ala Trp Leu Glu Phe Asp Val Asp Lys Arg Asp Ser Val Gly Val
        200             205             210
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2

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cgt att gac cgc aag cgt cgc cag cca gtc acc gta ctg ctg aag gct      1388
Arg Ile Asp Arg Lys Arg Arg Gln Pro Val Thr Val Leu Leu Lys Ala
    215             220             225

ctt ggc tgg acc act gag cag atc acc gag cgt ttc ggt ttc tct gaa      1436
Leu Gly Trp Thr Thr Glu Gln Ile Thr Glu Arg Phe Gly Phe Ser Glu
230             235             240             245

atc atg atg tcc acc ctc gag tcc gat ggt gta gca aac acc gat gag      1484
Ile Met Met Ser Thr Leu Glu Ser Asp Gly Val Ala Asn Thr Asp Glu
                250             255             260

gca ttg ctg gag atc tac cgc aag cag cgt cca ggc gag cag cct acc      1532
Ala Leu Leu Glu Ile Tyr Arg Lys Gln Arg Pro Gly Glu Gln Pro Thr
                265             270             275

cgc gac ctt gcg cag tcc ctc ctg gac aac agc ttc ttc cgt gca aag      1580
Arg Asp Leu Ala Gln Ser Leu Leu Asp Asn Ser Phe Phe Arg Ala Lys
            280             285             290

cgc tac gac ctg gct cgc gtt ggt cgt tac aag atc aac cgc aag ctc      1628
Arg Tyr Asp Leu Ala Arg Val Gly Arg Tyr Lys Ile Asn Arg Lys Leu
        295             300             305

ggc ctt ggt ggc gac cac gat ggt ttg atg act ctt act gaa gag gac      1676
Gly Leu Gly Gly Asp His Asp Gly Leu Met Thr Leu Thr Glu Glu Asp
310             315             320             325

atc gca acc acc atc gag tac ctg gtg cgt ctg cac gca ggt gag cgc      1724
Ile Ala Thr Thr Ile Glu Tyr Leu Val Arg Leu His Ala Gly Glu Arg
                330             335             340

gtc atg act tct cca aat ggt gaa gag atc cca gtc gag acc gat gac      1772
Val Met Thr Ser Pro Asn Gly Glu Glu Ile Pro Val Glu Thr Asp Asp
            345             350             355

atc gac cac ttt ggt aac cgt cgt ctg cgt acc gtt ggc gaa ctg atc      1820
Ile Asp His Phe Gly Asn Arg Arg Leu Arg Thr Val Gly Glu Leu Ile
        360             365             370

cag aac cag gtc cgt gtc ggc ctg tcc cgc atg gag cgc gtt gtt cgt      1868
Gln Asn Gln Val Arg Val Gly Leu Ser Arg Met Glu Arg Val Val Arg
        375             380             385

gag cgt atg acc acc cag gat gcg gag tcc att act cct act tcc ttg      1916
Glu Arg Met Thr Thr Gln Asp Ala Glu Ser Ile Thr Pro Thr Ser Leu
390             395             400             405

atc aac gtt cgt cct gtc tct gca gct atc cgt gag ttc ttc gga act      1964
Ile Asn Val Arg Pro Val Ser Ala Ala Ile Arg Glu Phe Phe Gly Thr
            410             415             420

tcc cag ctg tct cag ttc atg gac cag aac aac tcc ctg tct ggt ttg      2012
Ser Gln Leu Ser Gln Phe Met Asp Gln Asn Asn Ser Leu Ser Gly Leu
            425             430             435
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3

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act cac aag cgt cgt ctg tcg gct ctg ggc ccg ggt ggt ctg tcc cgt          2060
Thr His Lys Arg Arg Leu Ser Ala Leu Gly Pro Gly Gly Leu Ser Arg
        440                     445                 450

gag cgc gcc ggc atc gag gtt cga gac gtt cac cca tct cac tac ggc          2108
Glu Arg Ala Gly Ile Glu Val Arg Asp Val His Pro Ser His Tyr Gly
        455                     460                 465

cgt atg tgc cca att gag act ccg gaa ggt cca aac att ggc ctg atc          2156
Arg Met Cys Pro Ile Glu Thr Pro Glu Gly Pro Asn Ile Gly Leu Ile
470                     475                 480                 485

ggt tcc ttg gct tcc tat gct cga gtg aac cca ttc ggt ttc att gag          2204
Gly Ser Leu Ala Ser Tyr Ala Arg Val Asn Pro Phe Gly Phe Ile Glu
                    490                 495                 500

acc cca tac cgt cgc atc atc gac ggc aag ctg acc gac cag att gac          2252
Thr Pro Tyr Arg Arg Ile Ile Asp Gly Lys Leu Thr Asp Gln Ile Asp
                505                 510                 515

tac ctt acc gct gat gag gaa gac cgc ttc gtt gtt gcg cag gca aac          2300
Tyr Leu Thr Ala Asp Glu Glu Asp Arg Phe Val Val Ala Gln Ala Asn
        520                     525                 530

acg cac tac gac gaa gag ggc aac atc acc gat gag acc gtc act gtt          2348
Thr His Tyr Asp Glu Glu Gly Asn Ile Thr Asp Glu Thr Val Thr Val
        535                     540                 545

cgt ctg aag gac ggc gac atc gcc atg gtt ggc cgc aac gcg gtt gat          2396
Arg Leu Lys Asp Gly Asp Ile Ala Met Val Gly Arg Asn Ala Val Asp
550                     555                 560                 565

tac atg gac gtt tcc cct cgt cag atg gtt tct gtt ggt acc gcg atg          2444
Tyr Met Asp Val Ser Pro Arg Gln Met Val Ser Val Gly Thr Ala Met
                    570                 575                 580

att cca ttc ctg gag cac gac gat gct aac cgt gca ctg atg ggc gcg          2492
Ile Pro Phe Leu Glu His Asp Asp Ala Asn Arg Ala Leu Met Gly Ala
                    585                 590                 595

aac atg cag aag cag gct gtg cca ctg att cgt gcc gag gct cct ttc          2540
Asn Met Gln Lys Gln Ala Val Pro Leu Ile Arg Ala Glu Ala Pro Phe
                600                     605                 610

gtg ggc acc ggt atg gag cag cgc gca gca tac gac gcc ggc gac ctg          2588
Val Gly Thr Gly Met Glu Gln Arg Ala Ala Tyr Asp Ala Gly Asp Leu
        615                     620                 625

gtt att acc cca gtc gca ggt gtg gtg gaa aac gtt tca gct gac ttc          2636
Val Ile Thr Pro Val Ala Gly Val Val Glu Asn Val Ser Ala Asp Phe
630                     635                 640                 645

atc acc atc atg gct gat gac ggc aag cgc gaa acc tac ctg ctg cgt          2684
Ile Thr Ile Met Ala Asp Asp Gly Lys Arg Glu Thr Tyr Leu Leu Arg
                650                     655                 660

aag ttc cag cgc acc aac cag ggc acc agc tac aac cag aag cct ttg          2732
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4

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Lys Phe Gln Arg Thr Asn Gln Gly Thr Ser Tyr Asn Gln Lys Pro Leu
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Val Asn Leu Gly Glu Arg Val Glu Ala Gly Gln Val Ile Ala Asp Gly
        680                 685                 690

cca ggt acc ttc aat ggt gaa atg tcc ctt ggc cgt aac ctt ctg gtt    2828
Pro Gly Thr Phe Asn Gly Glu Met Ser Leu Gly Arg Asn Leu Leu Val
        695                 700                 705

gcg ttc atg cct tgg gaa ggc cac aac tac gag gat gcg atc atc ctc    2876
Ala Phe Met Pro Trp Glu Gly His Asn Tyr Glu Asp Ala Ile Ile Leu
710                 715                 720                 725

aac cag aac atc gtt gag cag gac atc ttg acc tcg atc cac atc gag    2924
Asn Gln Asn Ile Val Glu Gln Asp Ile Leu Thr Ser Ile His Ile Glu
                730                 735                 740

gag cac gag atc gat gcc cgc gac act aag ctt ggc gcc gaa gaa atc    2972
Glu His Glu Ile Asp Ala Arg Asp Thr Lys Leu Gly Ala Glu Glu Ile
                745                 750                 755

acc cgc gac atc cct aat gtg tct gaa gaa gtc ctc aag gac ctc gac    3020
Thr Arg Asp Ile Pro Asn Val Ser Glu Glu Val Leu Lys Asp Leu Asp
            760                 765                 770

gac cgc ggt att gtc cgc atc ggt gct gat gtt cgt gac ggc gac atc    3068
Asp Arg Gly Ile Val Arg Ile Gly Ala Asp Val Arg Asp Gly Asp Ile
        775                 780                 785

ctg gtc ggt aag gtc acc cct aag ggc gag acc gag ctc acc ccg gaa    3116
Leu Val Gly Lys Val Thr Pro Lys Gly Glu Thr Glu Leu Thr Pro Glu
790                 795                 800                 805

gag cgc ttg ctg cgc gca atc ttc ggt gag aag gcc cgc gaa gtt cgc    3164
Glu Arg Leu Leu Arg Ala Ile Phe Gly Glu Lys Ala Arg Glu Val Arg
                810                 815                 820

gat acc tcc atg aag gtg cct cac ggt gag acc ggc aag gtc atc ggc    3212
Asp Thr Ser Met Lys Val Pro His Gly Glu Thr Gly Lys Val Ile Gly
            825                 830                 835

gtg cgt cac ttc tcc cgc gag gac gac gac gat ctg gct cct ggc gtc    3260
Val Arg His Phe Ser Arg Glu Asp Asp Asp Asp Leu Ala Pro Gly Val
            840                 845                 850

aac gag atg atc cgt atc tac gtt gct cag aag cgt aag atc cag gac    3308
Asn Glu Met Ile Arg Ile Tyr Val Ala Gln Lys Arg Lys Ile Gln Asp
    855                 860                 865

ggc gat aag ctc gct ggc cgc cac ggt aac aag ggt gtt gtc ggt aaa    3356
Gly Asp Lys Leu Ala Gly Arg His Gly Asn Lys Gly Val Val Gly Lys
870                 875                 880                 885

att ttg cct cag gaa gat atg cca ttc ctt cca gac ggc act cct gtt    3404
Ile Leu Pro Gln Glu Asp Met Pro Phe Leu Pro Asp Gly Thr Pro Val
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5

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gac atc atc ttg aac acc cac ggt gtt cca cgt cgt atg aac att ggt     3452
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cag gtt ctt gag acc cac ctt ggc tgg ctg gca tct gct ggt tgg tcc     3500
Gln Val Leu Glu Thr His Leu Gly Trp Leu Ala Ser Ala Gly Trp Ser
            920                     925                     930

gtg gat cct gaa gat cct gag aac gct gag ctc gtc aag act ctg cct     3548
Val Asp Pro Glu Asp Pro Glu Asn Ala Glu Leu Val Lys Thr Leu Pro
            935                     940                     945

gca gac ctc ctc gag gtt cct gct ggt tcc ttg act gca act cct gtg     3596
Ala Asp Leu Leu Glu Val Pro Ala Gly Ser Leu Thr Ala Thr Pro Val
950                     955                     960                     965

ttc gac ggt gcg tca aac gaa gag ctc gca ggc ctg ctc gct aat tca     3644
Phe Asp Gly Ala Ser Asn Glu Glu Leu Ala Gly Leu Leu Ala Asn Ser
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cgt cca aac cgc gac ggc gac gtc atg gtt aac gcg gat ggt aaa gca     3692
Arg Pro Asn Arg Asp Gly Asp Val Met Val Asn Ala Asp Gly Lys Ala
                985                     990                     995

acg ctt atc  gac ggt cgc tcc ggt  gag cct tac ccg tac  ccg gtt     3737
Thr Leu Ile Asp Gly Arg Ser Gly Glu Pro Tyr Pro Tyr Pro Val
            1000                    1005                    1010

tcc atc ggc  tac atg tac atg ctg  aag ctg cac cac ctc  gtt gac     3782
Ser Ile Gly Tyr Met Tyr Met Leu Lys Leu His His Leu Val Asp
            1015                    1020                    1025

gag aag atc  cac gca cgt tcc act  ggt cct tac tcc atg  att acc     3827
Glu Lys Ile His Ala Arg Ser Thr Gly Pro Tyr Ser Met Ile Thr
            1030                    1035                    1040

cag cag cca  ctg ggt ggt aaa gca  cag ttc ggt gga cag  cgt ttc     3872
Gln Gln Pro Leu Gly Gly Lys Ala Gln Phe Gly Gly Gln Arg Phe
            1045                    1050                    1055

ggc gaa atg  gag gtg tgg gca atg  cag gca tac ggc gct  gcc tac     3917
Gly Glu Met Glu Val Trp Ala Met Gln Ala Tyr Gly Ala Ala Tyr
            1060                    1065                    1070

aca ctt cag  gag ctg ctg acc atc  aag tct gat gac gtg  gtt ggc     3962
Thr Leu Gln Glu Leu Leu Thr Ile Lys Ser Asp Asp Val Val Gly
            1075                    1080                    1085

cgt gtc aag  gtc tac gaa gca att  gtg aag ggc gag aac  atc ccg     4007
Arg Val Lys Val Tyr Glu Ala Ile Val Lys Gly Glu Asn Ile Pro
            1090                    1095                    1100

gat cca ggt  att cct gag tcc ttc  aag gtt ctc ctc aag  gag ctc     4052
Asp Pro Gly Ile Pro Glu Ser Phe Lys Val Leu Leu Lys Glu Leu
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6

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cag tcc ttg  tgc ctg aac gtg gag  gtt ctc tcc gca gac  ggc act        4097
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        1120                1125                1130

cca atg gag  ctc gcg ggt gac gac  gac gac ttc gat cag  gca ggc        4142
Pro Met Glu  Leu Ala Gly Asp Asp  Asp Asp Phe Asp Gln  Ala Gly
        1135                1140                1145

gcc tca ctt  ggc atc aac ctg tcc  cgt gac gag cgt tcc  gac gcc        4187
Ala Ser Leu  Gly Ile Asn Leu Ser  Arg Asp Glu Arg Ser  Asp Ala
        1150                1155                1160

gac acc gca  tagcagatca gaaaacaacc gctagaaatc aagccataca             4236
Asp Thr Ala
        1165

tcccccggac attgaagaga tgttctgggg ggaaagggag ttttacgtgc tcgacgtaaa    4296

cgtcttcgat gagctccgca tcggcctggc caccgccgac gacatccgcc gttggtccaa    4356

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tctgttctgc gagcgtatct tcggtccaac tcgcgactgg gagtgcgcct gcggtaagta    4476

caagcgtgtc cgctacaagg gcatcatctg tgaacgctgt ggcgttgagg tcaccaagtc    4536

caaggtgcgc cgtgagcgca tgggacacat tgagctcgct gcaccagtaa cccacatttg    4596

gtacttcaag ggcgttccat cacgcctcgg ctaccttttg gaccttgctc caaaggacct    4656

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cttcatcaag cttgctccaa agcagatgat ccgcgatgag aagctctacg atgaactgat    5016

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7

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Ala Pro Ile Glu Val Pro Gly Leu Leu Asp Leu Gln Leu Asp Ser Tyr
        35              40                  45

Ser Trp Leu Ile Gly Thr Pro Glu Trp Arg Ala Arg Gln Lys Glu Glu
    50              55                  60

Phe Gly Glu Gly Ala Arg Val Thr Ser Gly Leu Glu Asn Ile Leu Glu
65                  70                  75                      80

Glu Leu Ser Pro Ile Gln Asp Tyr Ser Gly Asn Met Ser Leu Ser Leu
                85                  90                  95

Ser Glu Pro Arg Phe Glu Asp Val Lys Asn Thr Ile Asp Glu Ala Lys
            100             105                 110

Glu Lys Asp Ile Asn Tyr Ala Ala Pro Leu Tyr Val Thr Ala Glu Phe
        115                 120                 125

Val Asn Asn Thr Thr Gly Glu Ile Lys Ser Gln Thr Val Phe Ile Gly
        130             135                 140

Asp Phe Pro Met Met Thr Asp Lys Gly Thr Phe Ile Ile Asn Gly Thr
145                 150                 155                     160

Glu Arg Val Val Val Ser Gln Leu Val Arg Ser Pro Gly Val Tyr Phe
                165                 170                 175

Asp Gln Thr Ile Asp Lys Ser Thr Glu Arg Pro Leu His Ala Val Lys
            180                 185                 190

Val Ile Pro Ser Arg Gly Ala Trp Leu Glu Phe Asp Val Asp Lys Arg
            195                 200                 205

Asp Ser Val Gly Val Arg Ile Asp Arg Lys Arg Arg Gln Pro Val Thr
        210                 215                 220

Val Leu Leu Lys Ala Leu Gly Trp Thr Thr Glu Gln Ile Thr Glu Arg
225                 230                 235                     240
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8

Phe Gly Phe Ser Glu Ile Met Met Ser Thr Leu Glu Ser Asp Gly Val
            245   250   255

Ala Asn Thr Asp Glu Ala Leu Leu Glu Ile Tyr Arg Lys Gln Arg Pro
            260   265   270

Gly Glu Gln Pro Thr Arg Asp Leu Ala Gln Ser Leu Leu Asp Asn Ser
            275   280   285

Phe Phe Arg Ala Lys Arg Tyr Asp Leu Ala Arg Val Gly Arg Tyr Lys
    290   295   300

Ile Asn Arg Lys Leu Gly Leu Gly Gly Asp His Asp Gly Leu Met Thr
305   310   315   320

Leu Thr Glu Glu Asp Ile Ala Thr Thr Ile Glu Tyr Leu Val Arg Leu
            325   330   335

His Ala Gly Glu Arg Val Met Thr Ser Pro Asn Gly Glu Glu Ile Pro
            340   345   350

Val Glu Thr Asp Asp Ile Asp His Phe Gly Asn Arg Arg Leu Arg Thr
            355   360   365

Val Gly Glu Leu Ile Gln Asn Gln Val Arg Val Gly Leu Ser Arg Met
    370   375   380

Glu Arg Val Val Arg Glu Arg Met Thr Thr Gln Asp Ala Glu Ser Ile
385   390   395   400

Thr Pro Thr Ser Leu Ile Asn Val Arg Pro Val Ser Ala Ala Ile Arg
                405   410   415

Glu Phe Phe Gly Thr Ser Gln Leu Ser Gln Phe Met Asp Gln Asn Asn
            420   425   430

Ser Leu Ser Gly Leu Thr His Lys Arg Arg Leu Ser Ala Leu Gly Pro
            435   440   445

Gly Gly Leu Ser Arg Glu Arg Ala Gly Ile Glu Val Arg Asp Val His
    450   455   460

9

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Pro Ser His Tyr Gly Arg Met Cys Pro Ile Glu Thr Pro Glu Gly Pro
465                 470             475             480

Asn Ile Gly Leu Ile Gly Ser Leu Ala Ser Tyr Ala Arg Val Asn Pro
            485             490             495

Phe Gly Phe Ile Glu Thr Pro Tyr Arg Arg Ile Ile Asp Gly Lys Leu
            500             505             510

Thr Asp Gln Ile Asp Tyr Leu Thr Ala Asp Glu Glu Asp Arg Phe Val
        515             520             525

Val Ala Gln Ala Asn Thr His Tyr Asp Glu Glu Gly Asn Ile Thr Asp
    530             535             540

Glu Thr Val Thr Val Arg Leu Lys Asp Gly Asp Ile Ala Met Val Gly
545             550             555             560

Arg Asn Ala Val Asp Tyr Met Asp Val Ser Pro Arg Gln Met Val Ser
            565             570             575

Val Gly Thr Ala Met Ile Pro Phe Leu Glu His Asp Asp Ala Asn Arg
            580             585             590

Ala Leu Met Gly Ala Asn Met Gln Lys Gln Ala Val Pro Leu Ile Arg
        595             600             605

Ala Glu Ala Pro Phe Val Gly Thr Gly Met Glu Gln Arg Ala Ala Tyr
    610             615             620

Asp Ala Gly Asp Leu Val Ile Thr Pro Val Ala Gly Val Val Glu Asn
625             630             635             640

Val Ser Ala Asp Phe Ile Thr Ile Met Ala Asp Asp Gly Lys Arg Glu
            645             650             655

Thr Tyr Leu Leu Arg Lys Phe Gln Arg Thr Asn Gln Gly Thr Ser Tyr
        660             665             670

Asn Gln Lys Pro Leu Val Asn Leu Gly Glu Arg Val Glu Ala Gly Gln
        675             680             685

Val Ile Ala Asp Gly Pro Gly Thr Phe Asn Gly Glu Met Ser Leu Gly
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Arg Asn Leu Leu Val Ala Phe Met Pro Trp Glu Gly His Asn Tyr Glu
705   710   715   720

Asp Ala Ile Ile Leu Asn Gln Asn Ile Val Glu Gln Asp Ile Leu Thr
                725   730   735

Ser Ile His Ile Glu Glu His Glu Ile Asp Ala Arg Asp Thr Lys Leu
                740   745   750

Gly Ala Glu Glu Ile Thr Arg Asp Ile Pro Asn Val Ser Glu Glu Val
        755   760   765

Leu Lys Asp Leu Asp Asp Arg Gly Ile Val Arg Ile Gly Ala Asp Val
    770   775   780

Arg Asp Gly Asp Ile Leu Val Gly Lys Val Thr Pro Lys Gly Glu Thr
785   790   795   800

Glu Leu Thr Pro Glu Glu Arg Leu Leu Arg Ala Ile Phe Gly Glu Lys
                805   810   815

Ala Arg Glu Val Arg Asp Thr Ser Met Lys Val Pro His Gly Glu Thr
                820   825   830

Gly Lys Val Ile Gly Val Arg His Phe Ser Arg Glu Asp Asp Asp Asp
        835   840   845

Leu Ala Pro Gly Val Asn Glu Met Ile Arg Ile Tyr Val Ala Gln Lys
    850   855   860

Arg Lys Ile Gln Asp Gly Asp Lys Leu Ala Gly Arg His Gly Asn Lys
865   870   875   880

Gly Val Val Gly Lys Ile Leu Pro Gln Glu Asp Met Pro Phe Leu Pro
                885   890   895

Asp Gly Thr Pro Val Asp Ile Ile Leu Asn Thr His Gly Val Pro Arg
            900   905   910

Arg Met Asn Ile Gly Gln Val Leu Glu Thr His Leu Gly Trp Leu Ala
        915   920   925

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Ser Ala Gly Trp Ser Val Asp Pro Glu Asp Pro Glu Asn Ala Glu Leu
    930                 935                 940

Val Lys Thr Leu Pro Ala Asp Leu Leu Glu Val Pro Ala Gly Ser Leu
945                 950                 955                 960

Thr Ala Thr Pro Val Phe Asp Gly Ala Ser Asn Glu Glu Leu Ala Gly
                965                 970                 975

Leu Leu Ala Asn Ser Arg Pro Asn Arg Asp Gly Asp Val Met Val Asn
                980                 985                 990

Ala Asp Gly Lys Ala Thr Leu Ile  Asp Gly Arg Ser Gly  Glu Pro Tyr
        995                 1000                1005

Pro Tyr  Pro Val Ser Ile Gly  Tyr Met Tyr Met Leu  Lys Leu His
    1010                1015                1020

His Leu  Val Asp Glu Lys Ile  His Ala Arg Ser Thr  Gly Pro Tyr
    1025                1030                1035

Ser Met  Ile Thr Gln Gln Pro  Leu Gly Gly Lys Ala  Gln Phe Gly
    1040                1045                1050

Gly Gln  Arg Phe Gly Glu Met  Glu Val Trp Ala Met  Gln Ala Tyr
    1055                1060                1065

Gly Ala  Ala Tyr Thr Leu Gln  Glu Leu Leu Thr Ile  Lys Ser Asp
    1070                1075                1080

Asp Val  Val Gly Arg Val Lys  Val Tyr Glu Ala Ile  Val Lys Gly
    1085                1090                1095

Glu Asn  Ile Pro Asp Pro Gly  Ile Pro Glu Ser Phe  Lys Val Leu
    1100                1105                1110

Leu Lys  Glu Leu Gln Ser Leu  Cys Leu Asn Val Glu  Val Leu Ser
    1115                1120                1125

Ala Asp  Gly Thr Pro Met Glu  Leu Ala Gly Asp Asp  Asp Asp Phe
    1130                1135                1140
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12

Asp Gln Ala Gly Ala Ser Leu Gly Ile Asn Leu Ser Arg Asp Glu
    1145   1150   1155

Arg Ser Asp Ala Asp Thr Ala
    1160   1165

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aaaatattga tgatttttac ggcgaccgca gcggccagaa gtacgaacag aaattgcttt   120

tcgacgcctc cctcgacgat gcagctgtct ctaagctggt tgcacaggcc gaaagcatcc   180

ctgatggaga tgtgagcaaa atcgcaaata ccgtaggtat tgtgatcggt gcggtattgg   240

ctctcgtggg cctggccggg tgttttgggg cgtttgggaa gaaacgtcga gaagcttaac   300

ctgctgttca aatagatttt ccctgtttcg aattgcggaa accccgggtt tgtttgctag   360

ggtgcctcgt agaaggggtc aagaagattt ctgggaaacg cgcccgtgcg gttggttgct   420

aatagcacgc ggagcaccag atgaaaaatc tcccctttac tttcgcgcgc gattggtata   480

ctctgagtcg ttgcgttgga attcgtgact ctttttcgtt cctgtagcgc caagaccttg   540

13

atcaaggtgg tttaaaaaaa ccgatttgac aaggtcattc agtgctatct ggagtcgttc   600

agggggatcg ggttcctcag cagaccaatt gctcaaaaat accagcggtg ttgatctgca   660

cttaatggcc ttgaccagcc aggtgcaatt acccgcgtga g gtg ctg gaa gga ctc   716
                                             Val Leu Glu Gly Leu
                                             1   5

atc ttg gca gtc tcc cgc cag acc aag tca gtc gtc gat att ccc ggt   764
Ile Leu Ala Val Ser Arg Gln Thr Lys Ser Val Val Asp Ile Pro Gly
             10   15   20

gca ccg cag cgt tat tct ttc gcg aag gtg tcc gca ccc att gag gtg   812
Ala Pro Gln Arg Tyr Ser Phe Ala Lys Val Ser Ala Pro Ile Glu Val
         25   30   35

ccc ggg cta cta gat ctt caa ctg gat tct tac tcc tgg ctg att ggt   860
Pro Gly Leu Leu Asp Leu Gln Leu Asp Ser Tyr Ser Trp Leu Ile Gly
         40   45   50

acg cct gag tgg cgt gct cgt cag aag gaa gaa ttc ggc gag gga gcc   908
Thr Pro Glu Trp Arg Ala Arg Gln Lys Glu Glu Phe Gly Glu Gly Ala
     55   60   65

cgc gta acc agc ggc ctt gag aac att ctc gag gag ctc tcc cca atc   956
Arg Val Thr Ser Gly Leu Glu Asn Ile Leu Glu Glu Leu Ser Pro Ile
70   75   80   85

cag gat tac tct gga aac atg tcc ctg agc ctt tcg gag cca cgc ttc   1004
Gln Asp Tyr Ser Gly Asn Met Ser Leu Ser Leu Ser Glu Pro Arg Phe
                 90   95   100

gaa gac gtc aag aac acc att gac gag gcg aaa gaa aag gac atc aac   1052
Glu Asp Val Lys Asn Thr Ile Asp Glu Ala Lys Glu Lys Asp Ile Asn
             105   110   115

tac gcg gcg cca ctg tat gtg acc gcg gag ttc gtc aac aac acc acc   1100
Tyr Ala Ala Pro Leu Tyr Val Thr Ala Glu Phe Val Asn Asn Thr Thr
         120   125   130

ggt gaa atc aag tct cag act gtc ttc atc ggc gat ttc cca atg atg   1148
Gly Glu Ile Lys Ser Gln Thr Val Phe Ile Gly Asp Phe Pro Met Met
     135   140   145

acg gac aag gga acg ttc atc atc aac gga acc gaa cgc gtt gtg gtc   1196
Thr Asp Lys Gly Thr Phe Ile Ile Asn Gly Thr Glu Arg Val Val Val
150   155   160   165

agc cag ctc gtc cgc tcc ccg ggc gtg tac ttt gac cag acc atc gat   1244
Ser Gln Leu Val Arg Ser Pro Gly Val Tyr Phe Asp Gln Thr Ile Asp
                 170   175   180

aag tca act gag cgt cca ctg cac gcc gtg aag gtt att cct ttc cgt   1292
Lys Ser Thr Glu Arg Pro Leu His Ala Val Lys Val Ile Pro Phe Arg
             185   190   195

ggt gct tgg ctt gag ttt gac gtc gat aag cgc gat tcg gtt ggt gtt   1340

14

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Gly Ala Trp Leu Glu Phe Asp Val Asp Lys Arg Asp Ser Val Gly Val
        200                 205             210

cgt att gac cgc aag cgt cgc cag cca gtc acc gta ctg ctg aag gct   1388
Arg Ile Asp Arg Lys Arg Arg Gln Pro Val Thr Val Leu Leu Lys Ala
    215                 220             225

ctt ggc tgg acc act gag cag atc acc gag cgt ttc ggt ttc tct gaa   1436
Leu Gly Trp Thr Thr Glu Gln Ile Thr Glu Arg Phe Gly Phe Ser Glu
230                 235             240                 245

atc atg atg tcc acc ctc gag tcc gat ggt gta gca aac acc gat gag   1484
Ile Met Met Ser Thr Leu Glu Ser Asp Gly Val Ala Asn Thr Asp Glu
                250             255             260

gca ttg ctg gag atc tac cgc aag cag cgt cca ggc gag cag cct acc   1532
Ala Leu Leu Glu Ile Tyr Arg Lys Gln Arg Pro Gly Glu Gln Pro Thr
            265             270             275

cgc gac ctt gcg cag tcc ctc ctg gac aac agc ttc ttc cgt gca aag   1580
Arg Asp Leu Ala Gln Ser Leu Leu Asp Asn Ser Phe Phe Arg Ala Lys
        280             285             290

cgc tac gac ctg gct cgc gtt ggt cgt tac aag atc aac cgc aag ctc   1628
Arg Tyr Asp Leu Ala Arg Val Gly Arg Tyr Lys Ile Asn Arg Lys Leu
    295             300             305

ggc ctt ggt ggc gac cac gat ggt ttg atg act ctt act gaa gag gac   1676
Gly Leu Gly Gly Asp His Asp Gly Leu Met Thr Leu Thr Glu Glu Asp
310             315             320             325

atc gca acc acc atc gag tac ctg gtg cgt ctg cac gca ggt gag cgc   1724
Ile Ala Thr Thr Ile Glu Tyr Leu Val Arg Leu His Ala Gly Glu Arg
                330             335             340

gtc atg act tct cca aat ggt gaa gag atc cca gtc gag acc gat gac   1772
Val Met Thr Ser Pro Asn Gly Glu Glu Ile Pro Val Glu Thr Asp Asp
            345             350             355

atc gac cac ttt ggt aac cgt cgt ctg cgt acc gtt ggc gaa ctg atc   1820
Ile Asp His Phe Gly Asn Arg Arg Leu Arg Thr Val Gly Glu Leu Ile
        360             365             370

cag aac cag gtc cgt gtc ggc ctg tcc cgc atg gag cgc gtt gtt cgt   1868
Gln Asn Gln Val Arg Val Gly Leu Ser Arg Met Glu Arg Val Val Arg
        375             380             385

gag cgt atg acc acc cag gat gcg gag tcc att act cct act tcc ttg   1916
Glu Arg Met Thr Thr Gln Asp Ala Glu Ser Ile Thr Pro Thr Ser Leu
390             395             400                 405

atc aac gtt cgt cct gtc tct gca gct atc cgt gag ttc ttc gga act   1964
Ile Asn Val Arg Pro Val Ser Ala Ala Ile Arg Glu Phe Phe Gly Thr
                410             415             420

tcc cag ctg tct cag ttc atg gtc cag aac aac tcc ctg tct ggt ttg   2012
Ser Gln Leu Ser Gln Phe Met Val Gln Asn Asn Ser Leu Ser Gly Leu
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15

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                        425                    430                        435

act cac aag cgt cgt ctg tcg gct ctg ggc ccg ggt ggt ctg tcc cgt         2060
Thr His Lys Arg Arg Leu Ser Ala Leu Gly Pro Gly Gly Leu Ser Arg
        440                    445                    450

gag cgc gcc ggc atc gag gtt cga gac gtt cac cca tct cac tac ggc         2108
Glu Arg Ala Gly Ile Glu Val Arg Asp Val His Pro Ser His Tyr Gly
        455                    460                    465

cgt atg tgc cca att gag act ccg gaa ggt cca aac att ggc ctg atc         2156
Arg Met Cys Pro Ile Glu Thr Pro Glu Gly Pro Asn Ile Gly Leu Ile
470                    475                    480                    485

ggt tcc ttg gct tcc tat gct cga gtg aac cca ttc ggt ttc att gag         2204
Gly Ser Leu Ala Ser Tyr Ala Arg Val Asn Pro Phe Gly Phe Ile Glu
                490                    495                    500

acc cca tac cgt cgc atc atc gac ggc aag ctg acc gac cag att gac         2252
Thr Pro Tyr Arg Arg Ile Ile Asp Gly Lys Leu Thr Asp Gln Ile Asp
                505                    510                    515

tac ctt acc gct gat gag gaa gac cgc ttc gtt gtt gcg cag gca aac         2300
Tyr Leu Thr Ala Asp Glu Glu Asp Arg Phe Val Val Ala Gln Ala Asn
                520                    525                    530

acg cac tac gac gaa gag ggc aac atc acc gat gag acc gtc act gtt         2348
Thr His Tyr Asp Glu Glu Gly Asn Ile Thr Asp Glu Thr Val Thr Val
        535                    540                    545

cgt ctg aag gac ggc gac atc gcc atg gtt ggc cgc aac gcg gtt gat         2396
Arg Leu Lys Asp Gly Asp Ile Ala Met Val Gly Arg Asn Ala Val Asp
550                    555                    560                    565

tac atg gac gtt tcc cct cgt cag atg gtt tct gtt ggt acc gcg atg         2444
Tyr Met Asp Val Ser Pro Arg Gln Met Val Ser Val Gly Thr Ala Met
                570                    575                    580

att cca ttc ctg gag cac gac gat gct aac cgt gca ctg atg ggc gcg         2492
Ile Pro Phe Leu Glu His Asp Asp Ala Asn Arg Ala Leu Met Gly Ala
                585                    590                    595

aac atg cag aag cag gct gtg cca ctg att cgt gcc gag gct cct ttc         2540
Asn Met Gln Lys Gln Ala Val Pro Leu Ile Arg Ala Glu Ala Pro Phe
                600                    605                    610

gtg ggc acc ggt atg gag cag cgc gca gca tac gac gcc ggc gac ctg         2588
Val Gly Thr Gly Met Glu Gln Arg Ala Ala Tyr Asp Ala Gly Asp Leu
        615                    620                    625

gtt att acc cca gtc gca ggt gtg gtg gaa aac gtt tca gct gac ttc         2636
Val Ile Thr Pro Val Ala Gly Val Val Glu Asn Val Ser Ala Asp Phe
630                    635                    640                    645

atc acc atc atg gct gat gac ggc aag cgc gaa acc tac ctg ctg cgt         2684
Ile Thr Ile Met Ala Asp Asp Gly Lys Arg Glu Thr Tyr Leu Leu Arg
                650                    655                    660
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16

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aag ttc cag cgc acc aac cag ggc acc agc tac aac cag aag cct ttg      2732
Lys Phe Gln Arg Thr Asn Gln Gly Thr Ser Tyr Asn Gln Lys Pro Leu
            665                 670                 675

gtt aac ttg ggc gag cgc gtt gaa gct ggc cag gtt att gct gat ggt      2780
Val Asn Leu Gly Glu Arg Val Glu Ala Gly Gln Val Ile Ala Asp Gly
            680                 685                 690

cca ggt acc ttc aat ggt gaa atg tcc ctt ggc cgt aac ctt ctg gtt      2828
Pro Gly Thr Phe Asn Gly Glu Met Ser Leu Gly Arg Asn Leu Leu Val
    695                 700                 705

gcg ttc atg cct tgg gaa ggc cac aac tac gag gat gcg atc atc ctc      2876
Ala Phe Met Pro Trp Glu Gly His Asn Tyr Glu Asp Ala Ile Ile Leu
710                 715                 720                 725

aac cag aac atc gtt gag cag gac atc ttg acc tcg atc cac atc gag      2924
Asn Gln Asn Ile Val Glu Gln Asp Ile Leu Thr Ser Ile His Ile Glu
                730                 735                 740

gag cac gag atc gat gcc cgc gac act aag ctt ggc gcc gaa gaa atc      2972
Glu His Glu Ile Asp Ala Arg Asp Thr Lys Leu Gly Ala Glu Glu Ile
                745                 750                 755

acc cgc gac atc cct aat gtg tct gaa gaa gtc ctc aag gac ctc gac      3020
Thr Arg Asp Ile Pro Asn Val Ser Glu Glu Val Leu Lys Asp Leu Asp
            760                 765                 770

gac cgc ggt att gtc cgc atc ggt gct gat gtt cgt gac ggc gac atc      3068
Asp Arg Gly Ile Val Arg Ile Gly Ala Asp Val Arg Asp Gly Asp Ile
            775                 780                 785

ctg gtc ggt aag gtc acc cct aag ggc gag acc gag ctc acc ccg gaa      3116
Leu Val Gly Lys Val Thr Pro Lys Gly Glu Thr Glu Leu Thr Pro Glu
790                 795                 800                 805

gag cgc ttg ctg cgc gca atc ttc ggt gag aag gcc cgc gaa gtt cgc      3164
Glu Arg Leu Leu Arg Ala Ile Phe Gly Glu Lys Ala Arg Glu Val Arg
                810                 815                 820

gat acc tcc atg aag gtg cct cac ggt gag acc ggc aag gtc atc ggc      3212
Asp Thr Ser Met Lys Val Pro His Gly Glu Thr Gly Lys Val Ile Gly
                825                 830                 835

gtg cgt cac ttc tcc cgc gag gac gac gac gat ctg gct cct ggc gtc      3260
Val Arg His Phe Ser Arg Glu Asp Asp Asp Asp Leu Ala Pro Gly Val
            840                 845                 850

aac gag atg atc cgt atc tac gtt gct cag aag cgt aag atc cag gac      3308
Asn Glu Met Ile Arg Ile Tyr Val Ala Gln Lys Arg Lys Ile Gln Asp
    855                 860                 865

ggc gat aag ctc gct ggc cgc cac ggt aac aag ggt gtt gtc ggt aaa      3356
Gly Asp Lys Leu Ala Gly Arg His Gly Asn Lys Gly Val Val Gly Lys
870                 875                 880                 885
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17

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att ttg cct cag gaa gat atg cca ttc ctt cca gac ggc act cct gtt        3404
Ile Leu Pro Gln Glu Asp Met Pro Phe Leu Pro Asp Gly Thr Pro Val
                890                 895                 900

gac atc atc ttg aac acc cac ggt gtt cca cgt cgt atg aac att ggt        3452
Asp Ile Ile Leu Asn Thr His Gly Val Pro Arg Arg Met Asn Ile Gly
                905                 910                 915

cag gtt ctt gag acc cac ctt ggc tgg ctg gca tct gct ggt tgg tcc        3500
Gln Val Leu Glu Thr His Leu Gly Trp Leu Ala Ser Ala Gly Trp Ser
                920                 925                 930

gtg gat cct gaa gat cct gag aac gct gag ctc gtc aag act ctg cct        3548
Val Asp Pro Glu Asp Pro Glu Asn Ala Glu Leu Val Lys Thr Leu Pro
        935                 940                 945

gca gac ctc ctc gag gtt cct gct ggt tcc ttg act gca act cct gtg        3596
Ala Asp Leu Leu Glu Val Pro Ala Gly Ser Leu Thr Ala Thr Pro Val
950                 955                 960                 965

ttc gac ggt gcg tca aac gaa gag ctc gca ggc ctg ctc gct aat tca        3644
Phe Asp Gly Ala Ser Asn Glu Glu Leu Ala Gly Leu Leu Ala Asn Ser
                970                 975                 980

cgt cca aac cgc gac ggc gac gtc atg gtt aac gcg gat ggt aaa gca        3692
Arg Pro Asn Arg Asp Gly Asp Val Met Val Asn Ala Asp Gly Lys Ala
                985                 990                 995

acg ctt atc  gac ggt cgc tcc ggt  gag cct tac ccg tac  ccg gtt        3737
Thr Leu Ile  Asp Gly Arg Ser Gly  Glu Pro Tyr Pro Tyr  Pro Val
            1000                1005                1010

tcc atc ggc  tac atg tac atg ctg  aag ctg cac cac ctc  gtt gac        3782
Ser Ile Gly  Tyr Met Tyr Met Leu  Lys Leu His His Leu  Val Asp
            1015                1020                1025

gag aag atc  cac gca cgt tcc act  ggt cct tac tcc atg  att acc        3827
Glu Lys Ile  His Ala Arg Ser Thr  Gly Pro Tyr Ser Met  Ile Thr
            1030                1035                1040

cag cag cca  ctg ggt ggt aaa gca  cag ttc ggt gga cag  cgt ttc        3872
Gln Gln Pro  Leu Gly Gly Lys Ala  Gln Phe Gly Gly Gln  Arg Phe
            1045                1050                1055

ggc gaa atg  gag gtg tgg gca atg  cag gca tac ggc gct  gcc tac        3917
Gly Glu Met  Glu Val Trp Ala Met  Gln Ala Tyr Gly Ala  Ala Tyr
            1060                1065                1070

aca ctt cag  gag ctg ctg acc atc  aag tct gat gac gtg  gtt ggc        3962
Thr Leu Gln  Glu Leu Leu Thr Ile  Lys Ser Asp Asp Val  Val Gly
            1075                1080                1085

cgt gtc aag  gtc tac gaa gca att  gtg aag ggc gag aac  atc ccg        4007
Arg Val Lys  Val Tyr Glu Ala Ile  Val Lys Gly Glu Asn  Ile Pro
            1090                1095                1100

gat cca ggt  att cct gag tcc ttc  aag gtt ctc ctc aag  gag ctc        4052
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Asp Pro Gly  Ile Pro Glu Ser Phe  Lys Val Leu Leu Lys  Glu Leu
        1105             1110                 1115

cag tcc ttg  tgc ctg aac gtg gag  gtt ctc tcc gca gac  ggc act      4097
Gln Ser Leu  Cys Leu Asn Val Glu  Val Leu Ser Ala Asp  Gly Thr
        1120             1125                 1130

cca atg gag  ctc gcg ggt gac gac  gac gac ttc gat cag  gca ggc      4142
Pro Met Glu  Leu Ala Gly Asp Asp  Asp Asp Phe Asp Gln  Ala Gly
        1135             1140                 1145

gcc tca ctt  ggc atc aac ctg tcc  cgt gac gag cgt tcc  gac gcc      4187
Ala Ser Leu  Gly Ile Asn Leu Ser  Arg Asp Glu Arg Ser  Asp Ala
        1150             1155                 1160

gac acc gca  tagcagatca gaaacaacc gctagaaatc aagccataca             4236
Asp Thr Ala
        1165

tccccggac attgaagaga tgttctgggg ggaaagggag ttttacgtgc tcgacgtaaa   4296

cgtcttcgat gagctccgca tcggcctggc caccgccgac gacatccgcc gttggtccaa   4356

gggtgaggtc aagaagccgg agaccatcaa ctaccgaacc ctcaagcctg agaaggacgg   4416

tctgttctgc gagcgtatct tcggtccaac tcgcgactgg gagtgcgcct gcggtaagta   4476

caagcgtgtc cgctacaagg gcatcatctg tgaacgctgt ggcgttgagg tcaccaagtc   4536

caaggtgcgc cgtgagcgca tgggacacat tgagctcgct gcaccagtaa cccacatttg   4596

gtacttcaag ggcgttccat cacgcctcgg ctaccttttg gaccttgctc caaaggacct   4656

ggacctcatc atctacttcg gtgcgaacat catcaccagc gtggacgaag aggctcgcca   4716

cagcgaccag accactcttg aggcagaaat gcttctggag aagaaggacg ttgaggcaga   4776

cgcagagtct gacattgctg agcgtgctga aaagctcgaa gaggatcttg ctgaacttga   4836

ggcagctggc gctaaggccg acgctcgccg caaggttcag gctgctgccg ataaggaaat   4896

gcagcacatc cgtgagcgtg cacagcgcga aatcgatcgt ctcgatgagg tctggcagac   4956

cttcatcaag cttgctccaa agcagatgat ccgcgatgag aagctctacg atgaactgat   5016

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19

Val Leu Glu Gly Leu Ile Leu Ala Val Ser Arg Gln Thr Lys Ser Val
1   5   10   15

Val Asp Ile Pro Gly Ala Pro Gln Arg Tyr Ser Phe Ala Lys Val Ser
          20   25   30

Ala Pro Ile Glu Val Pro Gly Leu Leu Asp Leu Gln Leu Asp Ser Tyr
          35   40   45

Ser Trp Leu Ile Gly Thr Pro Glu Trp Arg Ala Arg Gln Lys Glu Glu
      50   55   60

Phe Gly Glu Gly Ala Arg Val Thr Ser Gly Leu Glu Asn Ile Leu Glu
65   70   75   80

Glu Leu Ser Pro Ile Gln Asp Tyr Ser Gly Asn Met Ser Leu Ser Leu
            85   90   95

Ser Glu Pro Arg Phe Glu Asp Val Lys Asn Thr Ile Asp Glu Ala Lys
          100   105   110

Glu Lys Asp Ile Asn Tyr Ala Ala Pro Leu Tyr Val Thr Ala Glu Phe
          115   120   125

Val Asn Asn Thr Thr Gly Glu Ile Lys Ser Gln Thr Val Phe Ile Gly
          130   135   140

Asp Phe Pro Met Met Thr Asp Lys Gly Thr Phe Ile Ile Asn Gly Thr
145   150   155   160

Glu Arg Val Val Val Ser Gln Leu Val Arg Ser Pro Gly Val Tyr Phe
              165   170   175

Asp Gln Thr Ile Asp Lys Ser Thr Glu Arg Pro Leu His Ala Val Lys
          180   185   190

Val Ile Pro Phe Arg Gly Ala Trp Leu Glu Phe Asp Val Asp Lys Arg
          195   200   205

Asp Ser Val Gly Val Arg Ile Asp Arg Lys Arg Arg Gln Pro Val Thr
      210   215   220

Val Leu Leu Lys Ala Leu Gly Trp Thr Thr Glu Gln Ile Thr Glu Arg

20

Phe Gly Phe Ser Glu Ile Met Met Ser Thr Leu Glu Ser Asp Gly Val
                245   250   255

Ala Asn Thr Asp Glu Ala Leu Leu Glu Ile Tyr Arg Lys Gln Arg Pro
                260   265   270

Gly Glu Gln Pro Thr Arg Asp Leu Ala Gln Ser Leu Leu Asp Asn Ser
                275   280   285

Phe Phe Arg Ala Lys Arg Tyr Asp Leu Ala Arg Val Gly Arg Tyr Lys
    290   295   300

Ile Asn Arg Lys Leu Gly Leu Gly Gly Asp His Asp Gly Leu Met Thr
305   310   315   320

Leu Thr Glu Glu Asp Ile Ala Thr Thr Ile Glu Tyr Leu Val Arg Leu
                325   330   335

His Ala Gly Glu Arg Val Met Thr Ser Pro Asn Gly Glu Glu Ile Pro
                340   345   350

Val Glu Thr Asp Asp Ile Asp His Phe Gly Asn Arg Arg Leu Arg Thr
                355   360   365

Val Gly Glu Leu Ile Gln Asn Gln Val Arg Val Gly Leu Ser Arg Met
    370   375   380

Glu Arg Val Val Arg Glu Arg Met Thr Thr Gln Asp Ala Glu Ser Ile
385   390   395   400

Thr Pro Thr Ser Leu Ile Asn Val Arg Pro Val Ser Ala Ala Ile Arg
                405   410   415

Glu Phe Phe Gly Thr Ser Gln Leu Ser Gln Phe Met Val Gln Asn Asn
                420   425   430

Ser Leu Ser Gly Leu Thr His Lys Arg Arg Leu Ser Ala Leu Gly Pro
                435   440   445

Gly Gly Leu Ser Arg Glu Arg Ala Gly Ile Glu Val Arg Asp Val His
    450   455   460

21

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Pro Ser His Tyr Gly Arg Met Cys Pro Ile Glu Thr Pro Glu Gly Pro
465             470             475             480

Asn Ile Gly Leu Ile Gly Ser Leu Ala Ser Tyr Ala Arg Val Asn Pro
                485             490             495

Phe Gly Phe Ile Glu Thr Pro Tyr Arg Arg Ile Ile Asp Gly Lys Leu
            500             505             510

Thr Asp Gln Ile Asp Tyr Leu Thr Ala Asp Glu Glu Asp Arg Phe Val
        515             520             525

Val Ala Gln Ala Asn Thr His Tyr Asp Glu Glu Gly Asn Ile Thr Asp
    530             535             540

Glu Thr Val Thr Val Arg Leu Lys Asp Gly Asp Ile Ala Met Val Gly
545             550             555             560

Arg Asn Ala Val Asp Tyr Met Asp Val Ser Pro Arg Gln Met Val Ser
            565             570             575

Val Gly Thr Ala Met Ile Pro Phe Leu Glu His Asp Asp Ala Asn Arg
            580             585             590

Ala Leu Met Gly Ala Asn Met Gln Lys Gln Ala Val Pro Leu Ile Arg
        595             600             605

Ala Glu Ala Pro Phe Val Gly Thr Gly Met Glu Gln Arg Ala Ala Tyr
    610             615             620

Asp Ala Gly Asp Leu Val Ile Thr Pro Val Ala Gly Val Val Glu Asn
625             630             635             640

Val Ser Ala Asp Phe Ile Thr Ile Met Ala Asp Asp Gly Lys Arg Glu
            645             650             655

Thr Tyr Leu Leu Arg Lys Phe Gln Arg Thr Asn Gln Gly Thr Ser Tyr
        660             665             670

Asn Gln Lys Pro Leu Val Asn Leu Gly Glu Arg Val Glu Ala Gly Gln
    675             680             685
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22

Val Ile Ala Asp Gly Pro Gly Thr Phe Asn Gly Glu Met Ser Leu Gly
    690   695   700

Arg Asn Leu Leu Val Ala Phe Met Pro Trp Glu Gly His Asn Tyr Glu
705   710   715   720

Asp Ala Ile Ile Leu Asn Gln Asn Ile Val Glu Gln Asp Ile Leu Thr
            725   730   735

Ser Ile His Ile Glu Glu His Glu Ile Asp Ala Arg Asp Thr Lys Leu
            740   745   750

Gly Ala Glu Glu Ile Thr Arg Asp Ile Pro Asn Val Ser Glu Glu Val
        755   760   765

Leu Lys Asp Leu Asp Asp Arg Gly Ile Val Arg Ile Gly Ala Asp Val
    770   775   780

Arg Asp Gly Asp Ile Leu Val Gly Lys Val Thr Pro Lys Gly Glu Thr
785   790   795   800

Glu Leu Thr Pro Glu Glu Arg Leu Leu Arg Ala Ile Phe Gly Glu Lys
            805   810   815

Ala Arg Glu Val Arg Asp Thr Ser Met Lys Val Pro His Gly Glu Thr
            820   825   830

Gly Lys Val Ile Gly Val Arg His Phe Ser Arg Glu Asp Asp Asp
        835   840   845

Leu Ala Pro Gly Val Asn Glu Met Ile Arg Ile Tyr Val Ala Gln Lys
    850   855   860

Arg Lys Ile Gln Asp Gly Asp Lys Leu Ala Gly Arg His Gly Asn Lys
865   870   875   880

Gly Val Val Gly Lys Ile Leu Pro Gln Glu Asp Met Pro Phe Leu Pro
            885   890   895

Asp Gly Thr Pro Val Asp Ile Ile Leu Asn Thr His Gly Val Pro Arg
            900   905   910

23

Arg Met Asn Ile Gly Gln Val Leu Glu Thr His Leu Gly Trp Leu Ala
915 920 925

Ser Ala Gly Trp Ser Val Asp Pro Glu Asp Pro Glu Asn Ala Glu Leu
930 935 940

Val Lys Thr Leu Pro Ala Asp Leu Leu Glu Val Pro Ala Gly Ser Leu
945 950 955 960

Thr Ala Thr Pro Val Phe Asp Gly Ala Ser Asn Glu Glu Leu Ala Gly
965 970 975

Leu Leu Ala Asn Ser Arg Pro Asn Arg Asp Gly Asp Val Met Val Asn
980 985 990

Ala Asp Gly Lys Ala Thr Leu Ile Asp Gly Arg Ser Gly Glu Pro Tyr
995 1000 1005

Pro Tyr Pro Val Ser Ile Gly Tyr Met Tyr Met Leu Lys Leu His
1010 1015 1020

His Leu Val Asp Glu Lys Ile His Ala Arg Ser Thr Gly Pro Tyr
1025 1030 1035

Ser Met Ile Thr Gln Gln Pro Leu Gly Gly Lys Ala Gln Phe Gly
1040 1045 1050

Gly Gln Arg Phe Gly Glu Met Glu Val Trp Ala Met Gln Ala Tyr
1055 1060 1065

Gly Ala Ala Tyr Thr Leu Gln Glu Leu Leu Thr Ile Lys Ser Asp
1070 1075 1080

Asp Val Val Gly Arg Val Lys Val Tyr Glu Ala Ile Val Lys Gly
1085 1090 1095

Glu Asn Ile Pro Asp Pro Gly Ile Pro Glu Ser Phe Lys Val Leu
1100 1105 1110

Leu Lys Glu Leu Gln Ser Leu Cys Leu Asn Val Glu Val Leu Ser
1115 1120 1125

Ala Asp Gly Thr Pro Met Glu Leu Ala Gly Asp Asp Asp Asp Phe

24

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Asp Gln  Ala Gly Ala Ser Leu  Gly Ile Asn Leu Ser  Arg Asp Glu
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Arg Ser  Asp Ala Asp Thr Ala
    1160                1165
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<221>  mutation
<222>  (2016)..(2016)
<223>  Substitution of cytosine by thymine


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tcgacgcctc cctcgacgat gcagctgtct ctaagctggt tgcacaggcc gaaagcatcc      180

ctgatggaga tgtgagcaaa atcgcaaata ccgtaggtat tgtgatcggt gcggtattgg      240

ctctcgtggg cctggccggg tgttttgggg cgtttgggaa gaaacgtcga gaagcttaac      300

ctgctgttca aatagatttt ccctgtttcg aattgcggaa accccgggtt tgtttgctag      360

ggtgcctcgt agaaggggtc aagaagattt ctgggaaacg cgcccgtgcg gttggttgct      420

aatagcacgc ggagcaccag atgaaaaatc tcccctttac tttcgcgcgc gattggtata      480

ctctgagtcg ttgcgttgga attcgtgact ctttttcgtt cctgtagcgc caagaccttg      540

atcaaggtgg tttaaaaaaa ccgatttgac aaggtcattc agtgctatct ggagtcgttc      600

aggggatcg ggttcctcag cagaccaatt gctcaaaaat accagcggtg ttgatctgca      660

cttaatggcc ttgaccagcc aggtgcaatt acccgcgtga g gtg ctg gaa gga ccc     716
                                            Val Leu Glu Gly Pro
                                            1                 5


atc ttg gca gtc tcc cgc cag acc aag tca gtc gtc gat att ccc ggt      764
Ile Leu Ala Val Ser Arg Gln Thr Lys Ser Val Val Asp Ile Pro Gly
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25

gca ccg cag cgt tat tct ttc gcg aag gtg tcc gca ccc att gag gtg   812
Ala Pro Gln Arg Tyr Ser Phe Ala Lys Val Ser Ala Pro Ile Glu Val
        25   30   35

ccc ggg cta cta gat ctt caa ctg gat tct tac tcc tgg ctg att ggt   860
Pro Gly Leu Leu Asp Leu Gln Leu Asp Ser Tyr Ser Trp Leu Ile Gly
        40   45   50

acg cct gag tgg cgt gct cgt cag aag gaa gaa ttc ggc gag gga gcc   908
Thr Pro Glu Trp Arg Ala Arg Gln Lys Glu Glu Phe Gly Glu Gly Ala
        55   60   65

cgc gta acc agc ggc ctt gag aac att ctc gag gag ctc tcc cca atc   956
Arg Val Thr Ser Gly Leu Glu Asn Ile Leu Glu Glu Leu Ser Pro Ile
70   75   80   85

cag gat tac tct gga aac atg tcc ctg agc ctt tcg gag cca cgc ttc   1004
Gln Asp Tyr Ser Gly Asn Met Ser Leu Ser Leu Ser Glu Pro Arg Phe
                90   95   100

gaa gac gtc aag aac acc att gac gag gcg aaa gaa aag gac atc aac   1052
Glu Asp Val Lys Asn Thr Ile Asp Glu Ala Lys Glu Lys Asp Ile Asn
                105   110   115

tac gcg gcg cca ctg tat gtg acc gcg gag ttc gtc aac aac acc acc   1100
Tyr Ala Ala Pro Leu Tyr Val Thr Ala Glu Phe Val Asn Asn Thr Thr
                120   125   130

ggt gaa atc aag tct cag act gtc ttc atc ggc gat ttc cca atg atg   1148
Gly Glu Ile Lys Ser Gln Thr Val Phe Ile Gly Asp Phe Pro Met Met
        135   140   145

acg gac aag gga acg ttc atc atc aac gga acc gaa cgc gtt gtg gtc   1196
Thr Asp Lys Gly Thr Phe Ile Ile Asn Gly Thr Glu Arg Val Val Val
150   155   160   165

agc cag ctc gtc cgc tcc ccg ggc gtg tac ttt gac cag acc atc gat   1244
Ser Gln Leu Val Arg Ser Pro Gly Val Tyr Phe Asp Gln Thr Ile Asp
                170   175   180

aag tca act gag cgt cca ctg cac gcc gtg aag gtt att cct tcc cgt   1292
Lys Ser Thr Glu Arg Pro Leu His Ala Val Lys Val Ile Pro Ser Arg
                185   190   195

ggt gct tgg ctt gag ttt gac gtc gat aag cgc gat tcg gtt ggt gtt   1340
Gly Ala Trp Leu Glu Phe Asp Val Asp Lys Arg Asp Ser Val Gly Val
        200   205   210

cgt att gac cgc aag cgt cgc cag cca gtc acc gta ctg ctg aag gct   1388
Arg Ile Asp Arg Lys Arg Arg Gln Pro Val Thr Val Leu Leu Lys Ala
        215   220   225

ctt ggc tgg acc act gag cag atc acc gag cgt ttc ggt ttc tct gaa   1436
Leu Gly Trp Thr Thr Glu Gln Ile Thr Glu Arg Phe Gly Phe Ser Glu
230   235   240   245

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atc atg atg tcc acc ctc gag tcc gat ggt gta gca aac acc gat gag        1484
Ile Met Met Ser Thr Leu Glu Ser Asp Gly Val Ala Asn Thr Asp Glu
            250                 255                 260

gca ttg ctg gag atc tac cgc aag cag cgt cca ggc gag cag cct acc        1532
Ala Leu Leu Glu Ile Tyr Arg Lys Gln Arg Pro Gly Glu Gln Pro Thr
            265                 270                 275

cgc gac ctt gcg cag tcc ctc ctg gac aac agc ttc ttc cgt gca aag        1580
Arg Asp Leu Ala Gln Ser Leu Leu Asp Asn Ser Phe Phe Arg Ala Lys
            280                 285                 290

cgc tac gac ctg gct cgc gtt ggt cgt tac aag atc aac cgc aag ctc        1628
Arg Tyr Asp Leu Ala Arg Val Gly Arg Tyr Lys Ile Asn Arg Lys Leu
            295                 300                 305

ggc ctt ggt ggc gac cac gat ggt ttg atg act ctt act gaa gag gac        1676
Gly Leu Gly Gly Asp His Asp Gly Leu Met Thr Leu Thr Glu Glu Asp
310                 315                 320                 325

atc gca acc acc atc gag tac ctg gtg cgt ctg cac gca ggt gag cgc        1724
Ile Ala Thr Thr Ile Glu Tyr Leu Val Arg Leu His Ala Gly Glu Arg
                    330                 335                 340

gtc atg act tct cca aat ggt gaa gag atc cca gtc gag acc gat gac        1772
Val Met Thr Ser Pro Asn Gly Glu Glu Ile Pro Val Glu Thr Asp Asp
                345                 350                 355

atc gac cac ttt ggt aac cgt cgt ctg cgt acc gtt ggc gaa ctg atc        1820
Ile Asp His Phe Gly Asn Arg Arg Leu Arg Thr Val Gly Glu Leu Ile
            360                 365                 370

cag aac cag gtc cgt gtc ggc ctg tcc cgc atg gag cgc gtt gtt cgt        1868
Gln Asn Gln Val Arg Val Gly Leu Ser Arg Met Glu Arg Val Val Arg
            375                 380                 385

gag cgt atg acc acc cag gat gcg gag tcc att act cct act tcc ttg        1916
Glu Arg Met Thr Thr Gln Asp Ala Glu Ser Ile Thr Pro Thr Ser Leu
390                 395                 400                 405

atc aac gtt cgt cct gtc tct gca gct atc cgt gag ttc ttc gga act        1964
Ile Asn Val Arg Pro Val Ser Ala Ala Ile Arg Glu Phe Phe Gly Thr
            410                 415                 420

tcc cag ctg tct cag ttc atg gac cag aac aac tcc ctg tct ggt ttg        2012
Ser Gln Leu Ser Gln Phe Met Asp Gln Asn Asn Ser Leu Ser Gly Leu
            425                 430                 435

act tac aag cgt cgt ctg tcg gct ctg ggc ccg ggt ggt ctg tcc cgt        2060
Thr Tyr Lys Arg Arg Leu Ser Ala Leu Gly Pro Gly Gly Leu Ser Arg
            440                 445                 450

gag cgc gcc ggc atc gag gtt cga gac gtt cac cca tct cac tac ggc        2108
Glu Arg Ala Gly Ile Glu Val Arg Asp Val His Pro Ser His Tyr Gly
            455                 460                 465
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cgt atg tgc cca att gag act ccg gaa ggt cca aac att ggc ctg atc          2156
Arg Met Cys Pro Ile Glu Thr Pro Glu Gly Pro Asn Ile Gly Leu Ile
470             475             480             485

ggt tcc ttg gct tcc tat gct cga gtg aac cca ttc ggt ttc att gag          2204
Gly Ser Leu Ala Ser Tyr Ala Arg Val Asn Pro Phe Gly Phe Ile Glu
            490             495             500

acc cca tac cgt cgc atc atc gac ggc aag ctg acc gac cag att gac          2252
Thr Pro Tyr Arg Arg Ile Ile Asp Gly Lys Leu Thr Asp Gln Ile Asp
            505             510             515

tac ctt acc gct gat gag gaa gac cgc ttc gtt gtt gcg cag gca aac          2300
Tyr Leu Thr Ala Asp Glu Glu Asp Arg Phe Val Val Ala Gln Ala Asn
            520             525             530

acg cac tac gac gaa gag ggc aac atc acc gat gag acc gtc act gtt          2348
Thr His Tyr Asp Glu Glu Gly Asn Ile Thr Asp Glu Thr Val Thr Val
            535             540             545

cgt ctg aag gac ggc gac atc gcc atg gtt ggc cgc aac gcg gtt gat          2396
Arg Leu Lys Asp Gly Asp Ile Ala Met Val Gly Arg Asn Ala Val Asp
550             555             560             565

tac atg gac gtt tcc cct cgt cag atg gtt tct gtt ggt acc gcg atg          2444
Tyr Met Asp Val Ser Pro Arg Gln Met Val Ser Val Gly Thr Ala Met
            570             575             580

att cca ttc ctg gag cac gac gat gct aac cgt gca ctg atg ggc gcg          2492
Ile Pro Phe Leu Glu His Asp Asp Ala Asn Arg Ala Leu Met Gly Ala
            585             590             595

aac atg cag aag cag gct gtg cca ctg att cgt gcc gag gct cct ttc          2540
Asn Met Gln Lys Gln Ala Val Pro Leu Ile Arg Ala Glu Ala Pro Phe
            600             605             610

gtg ggc acc ggt atg gag cag cgc gca gca tac gac gcc ggc gac ctg          2588
Val Gly Thr Gly Met Glu Gln Arg Ala Ala Tyr Asp Ala Gly Asp Leu
            615             620             625

gtt att acc cca gtc gca ggt gtg gtg gaa aac gtt tca gct gac ttc          2636
Val Ile Thr Pro Val Ala Gly Val Val Glu Asn Val Ser Ala Asp Phe
630             635             640             645

atc acc atc atg gct gat gac ggc aag cgc gaa acc tac ctg ctg cgt          2684
Ile Thr Ile Met Ala Asp Asp Gly Lys Arg Glu Thr Tyr Leu Leu Arg
            650             655             660

aag ttc cag cgc acc aac cag ggc acc agc tac aac cag aag cct ttg          2732
Lys Phe Gln Arg Thr Asn Gln Gly Thr Ser Tyr Asn Gln Lys Pro Leu
            665             670             675

gtt aac ttg ggc gag cgc gtt gaa gct ggc cag gtt att gct gat ggt          2780
Val Asn Leu Gly Glu Arg Val Glu Ala Gly Gln Val Ile Ala Asp Gly
            680             685             690

cca ggt acc ttc aat ggt gaa atg tcc ctt ggc cgt aac ctt ctg gtt          2828
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Pro Gly Thr Phe Asn Gly Glu Met Ser Leu Gly Arg Asn Leu Leu Val
    695                     700                 705

gcg ttc atg cct tgg gaa ggc cac aac tac gag gat gcg atc atc ctc       2876
Ala Phe Met Pro Trp Glu Gly His Asn Tyr Glu Asp Ala Ile Ile Leu
710                     715                 720                 725

aac cag aac atc gtt gag cag gac atc ttg acc tcg atc cac atc gag       2924
Asn Gln Asn Ile Val Glu Gln Asp Ile Leu Thr Ser Ile His Ile Glu
                730                 735                 740

gag cac gag atc gat gcc cgc gac act aag ctt ggc gcc gaa gaa atc       2972
Glu His Glu Ile Asp Ala Arg Asp Thr Lys Leu Gly Ala Glu Glu Ile
                745                 750                 755

acc cgc gac atc cct aat gtg tct gaa gaa gtc ctc aag gac ctc gac       3020
Thr Arg Asp Ile Pro Asn Val Ser Glu Glu Val Leu Lys Asp Leu Asp
                760                 765                 770

gac cgc ggt att gtc cgc atc ggt gct gat gtt cgt gac ggc gac atc       3068
Asp Arg Gly Ile Val Arg Ile Gly Ala Asp Val Arg Asp Gly Asp Ile
        775                 780                 785

ctg gtc ggt aag gtc acc cct aag ggc gag acc gag ctc acc ccg gaa       3116
Leu Val Gly Lys Val Thr Pro Lys Gly Glu Thr Glu Leu Thr Pro Glu
790                 795                 800                 805

gag cgc ttg ctg cgc gca atc ttc ggt gag aag gcc cgc gaa gtt cgc       3164
Glu Arg Leu Leu Arg Ala Ile Phe Gly Glu Lys Ala Arg Glu Val Arg
                810                 815                 820

gat acc tcc atg aag gtg cct cac ggt gag acc ggc aag gtc atc ggc       3212
Asp Thr Ser Met Lys Val Pro His Gly Glu Thr Gly Lys Val Ile Gly
                825                 830                 835

gtg cgt cac ttc tcc cgc gag gac gac gac gat ctg gct cct ggc gtc       3260
Val Arg His Phe Ser Arg Glu Asp Asp Asp Asp Leu Ala Pro Gly Val
                840                 845                 850

aac gag atg atc cgt atc tac gtt gct cag aag cgt aag atc cag gac       3308
Asn Glu Met Ile Arg Ile Tyr Val Ala Gln Lys Arg Lys Ile Gln Asp
        855                 860                 865

ggc gat aag ctc gct ggc cgc cac ggt aac aag ggt gtt gtc ggt aaa       3356
Gly Asp Lys Leu Ala Gly Arg His Gly Asn Lys Gly Val Val Gly Lys
870                 875                 880                 885

att ttg cct cag gaa gat atg cca ttc ctt cca gac ggc act cct gtt       3404
Ile Leu Pro Gln Glu Asp Met Pro Phe Leu Pro Asp Gly Thr Pro Val
                890                 895                 900

gac atc atc ttg aac acc cac ggt gtt cca cgt cgt atg aac att ggt       3452
Asp Ile Ile Leu Asn Thr His Gly Val Pro Arg Arg Met Asn Ile Gly
                905                 910                 915

cag gtt ctt gag acc cac ctt ggc tgg ctg gca tct gct ggt tgg tcc       3500
Gln Val Leu Glu Thr His Leu Gly Trp Leu Ala Ser Ala Gly Trp Ser
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29

gtg gat cct gaa gat cct gag aac gct gag ctc gtc aag act ctg cct   3548
Val Asp Pro Glu Asp Pro Glu Asn Ala Glu Leu Val Lys Thr Leu Pro
        935   940   945

gca gac ctc ctc gag gtt cct gct ggt tcc ttg act gca act cct gtg   3596
Ala Asp Leu Leu Glu Val Pro Ala Gly Ser Leu Thr Ala Thr Pro Val
950   955   960   965

ttc gac ggt gcg tca aac gaa gag ctc gca ggc ctg ctc gct aat tca   3644
Phe Asp Gly Ala Ser Asn Glu Glu Leu Ala Gly Leu Leu Ala Asn Ser
                970   975   980

cgt cca aac cgc gac ggc gac gtc atg gtt aac gcg gat ggt aaa gca   3692
Arg Pro Asn Arg Asp Gly Asp Val Met Val Asn Ala Asp Gly Lys Ala
                985   990   995

acg ctt atc gac ggt cgc tcc ggt gag cct tac ccg tac ccg gtt   3737
Thr Leu Ile Asp Gly Arg Ser Gly Glu Pro Tyr Pro Tyr Pro Val
                1000   1005   1010

tcc atc ggc tac atg tac atg ctg aag ctg cac cac ctc gtt gac   3782
Ser Ile Gly Tyr Met Tyr Met Leu Lys Leu His His Leu Val Asp
                1015   1020   1025

gag aag atc cac gca cgt tcc act ggt cct tac tcc atg att acc   3827
Glu Lys Ile His Ala Arg Ser Thr Gly Pro Tyr Ser Met Ile Thr
                1030   1035   1040

cag cag cca ctg ggt ggt aaa gca cag ttc ggt gga cag cgt ttc   3872
Gln Gln Pro Leu Gly Gly Lys Ala Gln Phe Gly Gly Gln Arg Phe
                1045   1050   1055

ggc gaa atg gag gtg tgg gca atg cag gca tac ggc gct gcc tac   3917
Gly Glu Met Glu Val Trp Ala Met Gln Ala Tyr Gly Ala Ala Tyr
                1060   1065   1070

aca ctt cag gag ctg ctg acc atc aag tct gat gac gtg gtt ggc   3962
Thr Leu Gln Glu Leu Leu Thr Ile Lys Ser Asp Asp Val Val Gly
                1075   1080   1085

cgt gtc aag gtc tac gaa gca att gtg aag ggc gag aac atc ccg   4007
Arg Val Lys Val Tyr Glu Ala Ile Val Lys Gly Glu Asn Ile Pro
                1090   1095   1100

gat cca ggt att cct gag tcc ttc aag gtt ctc ctc aag gag ctc   4052
Asp Pro Gly Ile Pro Glu Ser Phe Lys Val Leu Leu Lys Glu Leu
                1105   1110   1115

cag tcc ttg tgc ctg aac gtg gag gtt ctc tcc gca gac ggc act   4097
Gln Ser Leu Cys Leu Asn Val Glu Val Leu Ser Ala Asp Gly Thr
                1120   1125   1130

cca atg gag ctc gcg ggt gac gac gac gac ttc gat cag gca ggc   4142
Pro Met Glu Leu Ala Gly Asp Asp Asp Asp Phe Asp Gln Ala Gly
                1135   1140   1145

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gcc tca ctt  ggc atc aac ctg tcc  cgt gac gag cgt tcc  gac gcc     4187
Ala Ser Leu  Gly Ile Asn Leu Ser  Arg Asp Glu Arg Ser  Asp Ala
        1150              1155              1160

gac acc gca  tagcagatca gaaaacaacc gctagaaatc aagccataca          4236
Asp Thr Ala
        1165

tcccccggac attgaagaga tgttctgggg ggaaagggag ttttacgtgc tcgacgtaaa  4296

cgtcttcgat gagctccgca tcggcctggc caccgccgac gacatccgcc gttggtccaa  4356

gggtgaggtc aagaagccgg agaccatcaa ctaccgaacc ctcaagcctg agaaggacgg  4416

tctgttctgc gagcgtatct tcggtccaac tcgcgactgg gagtgcgcct gcggtaagta  4476

caagcgtgtc cgctacaagg gcatcatctg tgaacgctgt ggcgttgagg tcaccaagtc  4536

caaggtgcgc cgtgagcgca tgggacacat tgagctcgct gcaccagtaa cccacatttg  4596

gtacttcaag ggcgttccat cacgcctcgg ctaccttttg gaccttgctc caaaggacct  4656

ggacctcatc atctacttcg gtgcgaacat catcaccagc gtggacgaag aggctcgcca  4716

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cgcagagtct gacattgctg agcgtgctga aaagctcgaa gaggatcttg ctgaacttga  4836

ggcagctggc gctaaggccg acgctcgccg caaggttcag gctgctgccg ataaggaaat  4896

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cttcatcaag cttgctccaa agcagatgat ccgcgatgag aagctctacg atgaactgat  5016

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ccagaacttc gaccttgatg ctg                                          5099


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<213>  Corynebacterium glutamicum

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Val Leu Glu Gly Pro Ile Leu Ala Val Ser Arg Gln Thr Lys Ser Val
1               5                   10                  15


Val Asp Ile Pro Gly Ala Pro Gln Arg Tyr Ser Phe Ala Lys Val Ser
            20                  25                  30


Ala Pro Ile Glu Val Pro Gly Leu Leu Asp Leu Gln Leu Asp Ser Tyr
        35                  40                  45
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31

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Ser Trp Leu Ile Gly Thr Pro Glu Trp Arg Ala Arg Gln Lys Glu Glu
    50              55              60

Phe Gly Glu Gly Ala Arg Val Thr Ser Gly Leu Glu Asn Ile Leu Glu
65              70              75                      80

Glu Leu Ser Pro Ile Gln Asp Tyr Ser Gly Asn Met Ser Leu Ser Leu
                85              90                      95

Ser Glu Pro Arg Phe Glu Asp Val Lys Asn Thr Ile Asp Glu Ala Lys
            100             105             110

Glu Lys Asp Ile Asn Tyr Ala Ala Pro Leu Tyr Val Thr Ala Glu Phe
            115             120             125

Val Asn Asn Thr Thr Gly Glu Ile Lys Ser Gln Thr Val Phe Ile Gly
    130             135             140

Asp Phe Pro Met Met Thr Asp Lys Gly Thr Phe Ile Ile Asn Gly Thr
145             150             155             160

Glu Arg Val Val Val Ser Gln Leu Val Arg Ser Pro Gly Val Tyr Phe
            165             170             175

Asp Gln Thr Ile Asp Lys Ser Thr Glu Arg Pro Leu His Ala Val Lys
            180             185             190

Val Ile Pro Ser Arg Gly Ala Trp Leu Glu Phe Asp Val Asp Lys Arg
            195             200             205

Asp Ser Val Gly Val Arg Ile Asp Arg Lys Arg Arg Gln Pro Val Thr
    210             215             220

Val Leu Leu Lys Ala Leu Gly Trp Thr Thr Glu Gln Ile Thr Glu Arg
225             230             235             240

Phe Gly Phe Ser Glu Ile Met Met Ser Thr Leu Glu Ser Asp Gly Val
            245             250             255

Ala Asn Thr Asp Glu Ala Leu Leu Glu Ile Tyr Arg Lys Gln Arg Pro
            260             265             270
```

32

Gly Glu Gln Pro Thr Arg Asp Leu Ala Gln Ser Leu Leu Asp Asn Ser
        275   280   285

Phe Phe Arg Ala Lys Arg Tyr Asp Leu Ala Arg Val Gly Arg Tyr Lys
        290   295   300

Ile Asn Arg Lys Leu Gly Leu Gly Gly Asp His Asp Gly Leu Met Thr
305   310   315   320

Leu Thr Glu Glu Asp Ile Ala Thr Thr Ile Glu Tyr Leu Val Arg Leu
                325   330   335

His Ala Gly Glu Arg Val Met Thr Ser Pro Asn Gly Glu Glu Ile Pro
                340   345   350

Val Glu Thr Asp Asp Ile Asp His Phe Gly Asn Arg Arg Leu Arg Thr
        355   360   365

Val Gly Glu Leu Ile Gln Asn Gln Val Arg Val Gly Leu Ser Arg Met
        370   375   380

Glu Arg Val Val Arg Glu Arg Met Thr Thr Gln Asp Ala Glu Ser Ile
385   390   395   400

Thr Pro Thr Ser Leu Ile Asn Val Arg Pro Val Ser Ala Ala Ile Arg
                405   410   415

Glu Phe Phe Gly Thr Ser Gln Leu Ser Gln Phe Met Asp Gln Asn Asn
                420   425   430

Ser Leu Ser Gly Leu Thr Tyr Lys Arg Arg Leu Ser Ala Leu Gly Pro
                435   440   445

Gly Gly Leu Ser Arg Glu Arg Ala Gly Ile Glu Val Arg Asp Val His
        450   455   460

Pro Ser His Tyr Gly Arg Met Cys Pro Ile Glu Thr Pro Glu Gly Pro
465   470   475   480

Asn Ile Gly Leu Ile Gly Ser Leu Ala Ser Tyr Ala Arg Val Asn Pro
                485   490   495

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Phe Gly Phe Ile Glu Thr Pro Tyr Arg Arg Ile Ile Asp Gly Lys Leu
            500                 505                 510

Thr Asp Gln Ile Asp Tyr Leu Thr Ala Asp Glu Glu Asp Arg Phe Val
            515                 520                 525

Val Ala Gln Ala Asn Thr His Tyr Asp Glu Glu Gly Asn Ile Thr Asp
            530                 535                 540

Glu Thr Val Thr Val Arg Leu Lys Asp Gly Asp Ile Ala Met Val Gly
545                 550                 555                 560

Arg Asn Ala Val Asp Tyr Met Asp Val Ser Pro Arg Gln Met Val Ser
                565                 570                 575

Val Gly Thr Ala Met Ile Pro Phe Leu Glu His Asp Asp Ala Asn Arg
            580                 585                 590

Ala Leu Met Gly Ala Asn Met Gln Lys Gln Ala Val Pro Leu Ile Arg
            595                 600                 605

Ala Glu Ala Pro Phe Val Gly Thr Gly Met Glu Gln Arg Ala Ala Tyr
        610                 615                 620

Asp Ala Gly Asp Leu Val Ile Thr Pro Val Ala Gly Val Val Glu Asn
625                 630                 635                 640

Val Ser Ala Asp Phe Ile Thr Ile Met Ala Asp Asp Gly Lys Arg Glu
                645                 650                 655

Thr Tyr Leu Leu Arg Lys Phe Gln Arg Thr Asn Gln Gly Thr Ser Tyr
            660                 665                 670

Asn Gln Lys Pro Leu Val Asn Leu Gly Glu Arg Val Glu Ala Gly Gln
            675                 680                 685

Val Ile Ala Asp Gly Pro Gly Thr Phe Asn Gly Glu Met Ser Leu Gly
        690                 695                 700

Arg Asn Leu Leu Val Ala Phe Met Pro Trp Glu Gly His Asn Tyr Glu
705                 710                 715                 720

Asp Ala Ile Ile Leu Asn Gln Asn Ile Val Glu Gln Asp Ile Leu Thr
```

Ser Ile His Ile Glu Glu His Glu Ile Asp Ala Arg Asp Thr Lys Leu
            740   745   750

Gly Ala Glu Glu Ile Thr Arg Asp Ile Pro Asn Val Ser Glu Glu Val
            755   760   765

Leu Lys Asp Leu Asp Asp Arg Gly Ile Val Arg Ile Gly Ala Asp Val
        770   775   780

Arg Asp Gly Asp Ile Leu Val Gly Lys Val Thr Pro Lys Gly Glu Thr
785   790   795   800

Glu Leu Thr Pro Glu Glu Arg Leu Leu Arg Ala Ile Phe Gly Glu Lys
                805   810   815

Ala Arg Glu Val Arg Asp Thr Ser Met Lys Val Pro His Gly Glu Thr
            820   825   830

Gly Lys Val Ile Gly Val Arg His Phe Ser Arg Glu Asp Asp Asp Asp
        835   840   845

Leu Ala Pro Gly Val Asn Glu Met Ile Arg Ile Tyr Val Ala Gln Lys
    850   855   860

Arg Lys Ile Gln Asp Gly Asp Lys Leu Ala Gly Arg His Gly Asn Lys
865   870   875   880

Gly Val Val Gly Lys Ile Leu Pro Gln Glu Asp Met Pro Phe Leu Pro
            885   890   895

Asp Gly Thr Pro Val Asp Ile Ile Leu Asn Thr His Gly Val Pro Arg
            900   905   910

Arg Met Asn Ile Gly Gln Val Leu Glu Thr His Leu Gly Trp Leu Ala
            915   920   925

Ser Ala Gly Trp Ser Val Asp Pro Glu Asp Pro Glu Asn Ala Glu Leu
    930   935   940

Val Lys Thr Leu Pro Ala Asp Leu Leu Glu Val Pro Ala Gly Ser Leu
945   950   955   960

35

Thr Ala Thr Pro Val Phe Asp Gly Ala Ser Asn Glu Glu Leu Ala Gly
            965   970   975

Leu Leu Ala Asn Ser Arg Pro Asn Arg Asp Gly Asp Val Met Val Asn
            980   985   990

Ala Asp Gly Lys Ala Thr Leu Ile Asp Gly Arg Ser Gly Glu Pro Tyr
            995   1000   1005

Pro Tyr Pro Val Ser Ile Gly Tyr Met Tyr Met Leu Lys Leu His
    1010   1015   1020

His Leu Val Asp Glu Lys Ile His Ala Arg Ser Thr Gly Pro Tyr
    1025   1030   1035

Ser Met Ile Thr Gln Gln Pro Leu Gly Gly Lys Ala Gln Phe Gly
    1040   1045   1050

Gly Gln Arg Phe Gly Glu Met Glu Val Trp Ala Met Gln Ala Tyr
    1055   1060   1065

Gly Ala Ala Tyr Thr Leu Gln Glu Leu Leu Thr Ile Lys Ser Asp
    1070   1075   1080

Asp Val Val Gly Arg Val Lys Val Tyr Glu Ala Ile Val Lys Gly
    1085   1090   1095

Glu Asn Ile Pro Asp Pro Gly Ile Pro Glu Ser Phe Lys Val Leu
    1100   1105   1110

Leu Lys Glu Leu Gln Ser Leu Cys Leu Asn Val Glu Val Leu Ser
    1115   1120   1125

Ala Asp Gly Thr Pro Met Glu Leu Ala Gly Asp Asp Asp Asp Phe
    1130   1135   1140

Asp Gln Ala Gly Ala Ser Leu Gly Ile Asn Leu Ser Arg Asp Glu
    1145   1150   1155

Arg Ser Asp Ala Asp Thr Ala
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aaccattcta acaagggatt tggtgttttc tgcggctagc tgataatgtg aacggctgag   240

tcccactctt gtagttggga attgacggca cctcgcactc aagcgcggta cgcccctgg   300

ttttccggga cgcggtggcg catgtttgca tttgatgagg ttgtccgtga catgtttggt   360

cgggccccaa aaagagcccc cttttttgcg tgtctggaca ctttttcaaa tccttcgcca   420

tcgacaagct cagccttcgt gttcgtcccc cgggcgtcac gtcagcagtt aaagaacaac   480

tccgaaataa ggatggttc atg cca act att cag cag ctg gtc cgt aag ggc   532
                        Met Pro Thr Ile Gln Gln Leu Val Arg Lys Gly
                         1   5   10

cgc cac gat aag tcc gcc aag gtg gct acc gcg gca ctg aag ggt tcc   580
Arg His Asp Lys Ser Ala Lys Val Ala Thr Ala Ala Leu Lys Gly Ser
              15   20   25

cct cag cgt cgt ggc gta tgc acc cgt gtg tac acc acc acc cct aag   628
Pro Gln Arg Arg Gly Val Cys Thr Arg Val Tyr Thr Thr Thr Pro Lys
          30   35   40

aag cct aac tct gct ctt cgt aag gtc gct cgt gtg cgc ctt acc tcc   676
Lys Pro Asn Ser Ala Leu Arg Lys Val Ala Arg Val Arg Leu Thr Ser
      45   50   55

ggc atc gag gtt tcc gct tac atc cct ggt gag ggc cac aac ctg cag   724
Gly Ile Glu Val Ser Ala Tyr Ile Pro Gly Glu Gly His Asn Leu Gln
60   65   70   75

gag cac tcc atg gtg ctc gtt cgc ggt ggt cgt gtt aag gac ctc cca   772
Glu His Ser Met Val Leu Val Arg Gly Gly Arg Val Lys Asp Leu Pro
                  80   85   90

ggt gtc cgt tac aag atc gtc cgt ggc gca ctg gat acc cag ggt gtt   820
Gly Val Arg Tyr Lys Ile Val Arg Gly Ala Leu Asp Thr Gln Gly Val
                  95   100   105

37

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aag gac cgc aag cag gct cgt tcc ccg cta cgg cgc gaa gag ggg ata        868
Lys Asp Arg Lys Gln Ala Arg Ser Pro Leu Arg Arg Glu Glu Gly Ile
        110                 115                 120

att aaa aat gcg taaatcagca gctcctaagc gtccagtagt tcaggaccct           920
Ile Lys Asn Ala
        125

gtatacaagt ccgagctcgt tacccagctc gtaaacaaga tcctcatcgg tggcaagaag     980

tccaccgcag agcgcatcgt ctacggtgca ctcgagatct gccgtgagaa gaccggcacc     1040

gatccagtag gaaccctcga gaaggctctc ggcaacgtgc gtccagacct cgaagttcgt     1100

tcccgccgtg ttggtggcgc tacctaccag gtgccagtgg atgttcgccc agagcgcgca     1160

aacaccctcg cactgcgttg gttggtaacc ttcacccgtc agcgtcgtga gaacaccatg     1220

atcgagcgtc ttgcaaacga acttctggat gcagccaacg gccttggcgc ttccgtgaag     1280

cgtcgcgaag acacccacaa gatggcagag gccaaccgcg ccttcgctca ctaccgctgg     1340

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cccggtaata aataagtgaa ttaccgtaac caacaagttg gggtaccact gtggcacaag     1700

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1               5                   10                  15


Ala Lys Val Ala Thr Ala Ala Leu Lys Gly Ser Pro Gln Arg Arg Gly
            20                  25                  30


Val Cys Thr Arg Val Tyr Thr Thr Thr Pro Lys Lys Pro Asn Ser Ala
        35                  40                  45
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Leu Arg Lys Val Ala Arg Val Arg Leu Thr Ser Gly Ile Glu Val Ser
    50                  55                  60

Ala Tyr Ile Pro Gly Glu Gly His Asn Leu Gln Glu His Ser Met Val
65                  70                  75                  80

Leu Val Arg Gly Gly Arg Val Lys Asp Leu Pro Gly Val Arg Tyr Lys
                85                  90                  95

Ile Val Arg Gly Ala Leu Asp Thr Gln Gly Val Lys Asp Arg Lys Gln
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Ala Arg Ser Pro Leu Arg Arg Glu Glu Gly Ile Ile Lys Asn Ala
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